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국제학석사학위논문

The Impact of Central Bank
Communication on Financial Markets: the
case of the People's Bank of China

중앙은행 커뮤니케이션이 금융시장에 미치는 영향:
중국인민은행의 경우

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이 단 단

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by

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Abstract

The Impact of Central Bank Communication on Financial Markets: the case of the People's Bank of China

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Central bank communication can be defined as the provision of information by the central bank to the public regarding such matters as the objectives of monetary policy, the monetary policy strategy, the economic outlook, and the outlook for future policy decisions. (Blinder et al., 2008) Although such a practice used to be considered as obnoxious by central bankers, a fundamental shift has taken place since 1990s with central banks coming out of mystery and becoming more open and transparent. The underlying theories suggest that communication can help central banks to steer the financial markets by managing market expectations, and in turn influence the real economy. Due to the difficulty involved in examining central bank communication effectiveness by capturing its impact on inflation, output and employment, most of the

literature takes a more direct and econometrically feasible approach to measure the correlation between central bank communication events and the moves of financial market returns and volatility. A growing number of studies have been done on advanced central banks, whereas the research on the Chinese central bank – the People’s Bank of China (PBoC) – is still at its primary stage. This dissertation attempts to measure the impact of PBoC communication on financial markets, as a forthright approach to examine the effectiveness of central bank communication in China, and then draw some pertinent implications.

After a review of theories of central bank communication and its connection with financial markets, I conduct an empirical research employing an EGARCH model to capture both the “price effect” and the “volatility effect” of central bank communication on Chinese financial markets. Daily data of asset returns in money markets, bond markets, stock markets and foreign exchange markets from October 2006 to September 2015 are used. A comparison of three sub periods is done as well, to reflect the variant results before, during and after the 2008 global financial crisis. Moreover, in order to understand communication’s importance relative to monetary policy instruments for the PBoC, I also compare its impact on financial markets with that of the benchmark lending and deposit rate changes, the reserve requirement ratio adjustments and the open market operations etc.

The results show that throughout the sample period PBoC communication

generally moves the interest rates as well as the stock market returns toward its desired direction and also influences financial market volatilities in a statistically significant way, and that PBoC communication has been playing an increasingly important role in efficiently managing market expectations and promoting monetary policy effectiveness after the 2008 global financial crisis, both in absolute terms and in relative terms - compared with the effectiveness of monetary policy instruments.

Key words: central bank communication, financial market, the People's Bank of China

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I. Introduction

1. Background and motivation

In a then best-seller book published nearly three decades ago - “Secrets of the Temple: How the Federal Reserve Runs the Country” (Greider, 1987), the Federal Reserve (Fed) was described to be secretive, tight-lipped and remote, who did not even announce its policy decisions, let alone explained them. Alan Greenspan, then Chairman of the Fed, was the archetype of an equivocating central banker, who said “since I’ve become a central banker, I’ve learned to mumble with great incoherence. If I seem unduly clear to you, you must have misunderstood what I said.” (Quotes in Wall Street Journal, September 22, 1987) This was true not only for the Fed, but also for all the other central banks in the world at that time. However, a fundamental shift has taken place since 1990s with central banks coming out of mystery and becoming more open and transparent. Greater importance has been put on communication in order to deliver higher monetary policy effectiveness. Frederic Mishkin speaks of a “revolution in the way central banks communicate with the markets and the public” (2004). After the global financial crisis, central bank communication became even more active as an unconventional measure to achieve central bank goals. Particularly, forward guidance has been used by the Fed, the European Central Bank (ECB) and the Bank of England (BoE) to guide the market expectations for low long-term interest rates, in order to boost the economic recovery. Literature on central bank communication has been growing steadily against this background, including both theoretical exploration and

empirical research.

Since 2006, Chinese central bank - the People's Bank of China (PBoC) - has been putting more weight on communication as well. Governor Zhou Xiaochuan was reported to advocate that monetary policy should go to the market "as expected" rather than "by surprise". Despite the PBoC's efforts to improve its communication, there is still a big gap between the communication practices of the PBoC and those of the Fed or the ECB. In terms of communication, the PBoC has been ranked third-worst of 14 big central banks as reported by a Barclays survey in 2014. According to a broader index of transparency constructed by Dincer and Eichengreen (2014), the PBoC scored 4 over 15 in 2010, similarly as Bahrain, Bangladesh, Maldives and Venezuela.

2. Research design

The focus of this dissertation is on the effectiveness of PBoC's communication in spite of its relatively low level of transparency. This dissertation aims to 1) summarize the underlying theories of central bank communication as well as its connection with financial markets, 2) answer the main research question "how effectively has the PBoC been communicating?" by conducting an empirical study on the impact of PBoC communication on Chinese financial markets including both a price effect and a volatility effect, and 3) draw some pertinent implications.

Since the literature on the impact of central bank communication on financial markets

in China is still limited in both quantitative and qualitative senses, study done in this dissertation may add to the literature with an updated empirical analysis. What distincts this dissertation from the existing literature is that it not only examines the overall impact of central bank communication on the Chinese financial markets during the sample period but also compares the results before, during and after the recent global financial crisis for the first time, as far as I know. However, since this study involves subjective judgments of monetary stance bias communicated by the PBoC, measurement errors can be possible in some cases, which is one of the potential weaknesses of this study. Besides, verbal communication contents are searched out with a search engine on the Internet, which may not cover all relevant information. A more reliable newswire may be used in future research.

The rest of this dissertation is organized as follows. Section II gives an overall introduction of central bank communication theories followed by a more specific discussion on the connection between central bank communication and financial markets. Section III selectively reviews the literature on central bank communication effectiveness in major developed countries and in China. Most of the literature takes the econometrically convenient approach to perform this task by examining central bank communication's impact on financial markets, as this dissertation does. In section IV, I present my research methodology and data selection. To measure the influence of PBoC communication on both the asset price levels and volatilities in financial markets, an EGARCH model is constructed involving a variable which quantifies central bank

communication taking a narrative approach. Section V reports the empirical results and interprets them. Three key questions are answered in this section: 1) Whether communication has helped the PBoC in moving financial asset prices and influencing financial market volatilities in the desired way? 2) How has the role of communication changed after the global financial crisis? 3) What's the importance of communication compared with central bank monetary policy instruments in moving financial markets? Finally, in section VI, I reach my conclusion and discuss some pertinent implications.

II. Understanding central bank communication

The very first question to deal with is: what is the definition of central bank communication? Blinder et al. define central bank communication as “the provision of information by the central bank to the public regarding such matters as the objectives of monetary policy, the monetary policy strategy, the economic outlook, and the outlook for future policy decisions” (2008). This information was kept almost completely secret before the 1990s, while it has become increasingly available to the public afterwards. Thus, there comes another important question: what are the theoretical foundations of these two distinct ways of thinking adopted by central banks earlier and now? The following sub-section reviews the related theories.

1. Underlying theories

There are distinct theoretical foundations behind central banks' two different ways of thinking and behavior. In the new classical economics, all agents are assumed to maximize utility based on rational expectations. This kind of expectations is defined by the Rational Expectations theory as being identical to the optimal forecast that uses all available information. Therefore, rational expectations do not differ from equilibrium results systematically or predictably. Through price and wage adjustment, the economy runs at the equilibrium level with full employment and achieves its potential output, at any time. Sargent and Wallace, applying rational expectations, produced the Policy-Ineffectiveness Proposition (1975, 1976), according to which, no matter what

monetary policy the central bank employed, agents would foresee the effects and expect wage and price to change accordingly. As a result, wage and price move instantly; real wages remain constant and so does output. This implies that only unanticipated shocks to the economy are able to cause deviations from equilibrium. Influenced by these theories, for a long period, central banks believed that their goals could be achieved only with unexpected and cryptic monetary policies. It was believed that the effectiveness of monetary policy is directly proportional to the monetary policy shocks (the information is provided by surprising market actors) (Brunner, 1981), while communication and transparency were considered as impolitic which could harm the effectiveness of monetary policies. (Blinder et al, 2008)

On the other hand, although New Keynesian macroeconomics also assumes that households and firms have rational expectations, it acknowledges the stickiness of wage and price, which implies that it normally takes a long time before the market re-clear in case of shocks. Most of the time, the economy operates at a non-equilibrium level. Since market decisions are made mainly based on expectations about the future rather than the situations today, central banks should communicate with the market to influence their expectations, in order to improve monetary policy effectiveness. The view that monetary policy is, at least in part, about managing expectations is by now standard fare both in academia and in central banking circles. (Blinder et al, 2008) For example, Woodford argues that the success of monetary policy is not guaranteed just by controlling short-term interest rates, but also by influencing market expectations in

the desired direction (2005).

In a survey done in 2008, Blinder et al. summarized a good explanation of why central bank communication can matter. The basic idea is that in an unrealistic financial system with not only rational expectations, but also symmetric information and stationary economic environment, there is no room for central bank communication to play an independent role. However, as deviations from these conditions are the norm but not the exception, which include asymmetric information and non-stationary economic environment, central bank communication becomes relevant for policy actions.

A related concept to central bank communication is central bank transparency. According to Geraats, an economic definition of transparency is the absence of asymmetric information. In the case of perfect transparency, all agents are equally well-informed (2014). Whereas transparency requires central banks to provide information to the general public as much and as soon as possible, central bank communication is intentionally designed to manipulate the expectations and behaviors of economic actors by providing certain information, with the purpose of achieving central bank goals such as price stability. Therefore, there is clear distinction between central bank communication and transparency. Indeed, central bank communication may facilitate transparency, but not for transparency per se, and sometimes too much transparency does bad rather than good. In other words, “the more information, the

better” is not always true. A broadly criticized communicator is then-ECB President Wim Duisenberg, who, in October 2000, hinted to an interviewer that the ECB would not make any further intervention to support the euro. This thoughtless communication caused the euro to depreciate immediately. Amato, Morris, and Shin emphasize this point by highlighting the double-edged nature of public information when used for policy purposes - while it is very effective in influencing actions through coordination, sometimes it can be too effective and coordinate actions away from fundamentals (2002).

Dale, Orphanides and Österholm (2011) consider the potential benefits and limitations of central bank communication in a model of imperfect knowledge and learning and argue that the mantra of “more information is always better” is neither sufficient nor correct. They point out that because of imperfect information, central bank communication may play a role to inform and improve the public’s understanding, or, to distract and mislead. This implies that there may be costs associated with publishing uncertain information, and that central banks should focus their communication on the information they really know about.

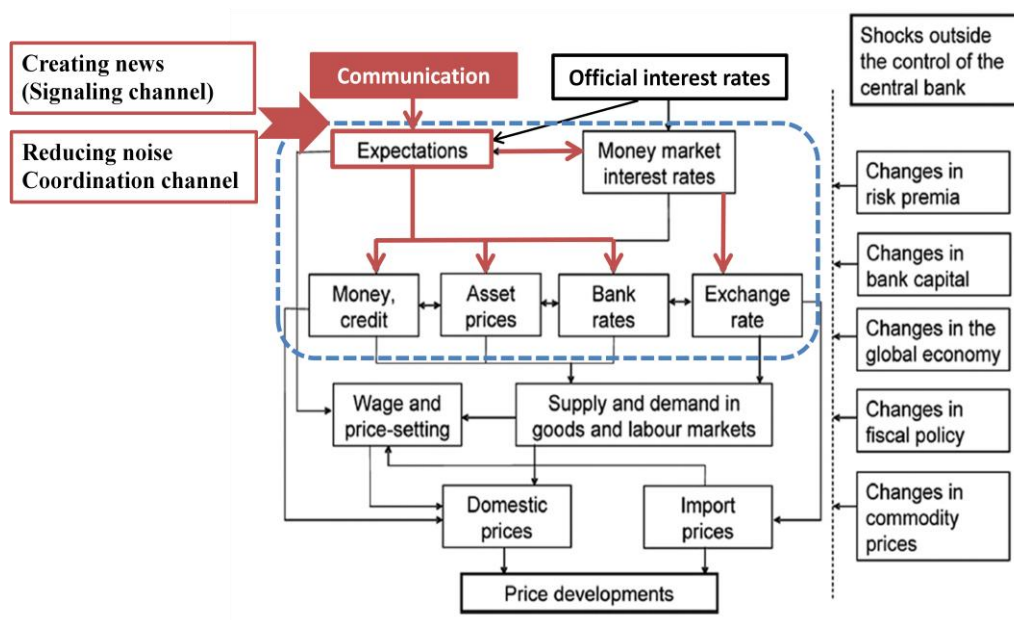
In contrast, Geraats provides an economic explanation for the role of oblique communication and argues that the optimal communication strategy for a central bank is to provide clarity about the inflation target but to provide information with perceived ambiguity about the output-gap target and supply shocks (2007). All of these point to a

policy implication, which is, before conducting communication, central banks should be clear about their objectives, what messages they want to deliver, what responses they hope to receive from the market, and make a tactical plan on what information to publish, when and how.

2. Central bank communication and financial markets

This sub-section moves on to discuss the efficacy of central bank communication in managing market expectations and promoting monetary policy effectiveness. As explained in the previous section, central bank communication is supposed to be able to finally affect inflation, employment and output levels through the expectation channel. This process is illustrated in **Figure 1** - central bank communication influences money market interest rates and other financial asset prices and those prices continue to impose effect on the real economy. However, though financial markets move quickly with central bank communication, financial prices affect the economy only gradually - with the proverbial long and variable lags. These time lags combined with many other macro variables that are exerting influence on the economy at the same time make it prohibitively difficult to analysis the impact of central bank communication on the real economy. In contrast, the impact of central bank communication on financial markets is, like monetary policy instruments, instant and can be relatively easily measured.

Figure 1. Central bank communication and financial markets



Edited by the author of this dissertation based on a typical monetary transmission mechanism illustrated by the ECB

A relevant question to ask here is: how does the so-called expectation channel function in moving financial markets along with central bank communication at all? A number of factors could come into play here. First, the central bank can move financial markets by “creating news”, since it is an important player in financial markets, the communication about its impending actions - such as raising or decreasing the policy rates - can affect asset prices directly. This channel has also been labeled the “signaling channel” in the literature. Second, central bank communication can also influence financial markets by “reducing noises”. As central banks normally hold both qualitatively and quantitatively better information than the public and have better technical as well as analytical capacities, communication by central banks might play a

role as a coordination device, thereby reducing heterogeneity in expectations and information and thus inducing asset prices to more closely reflect the underlying fundamentals. This “coordination channel” might imply that central bank communication has longer-lasting effects, as they might change the dynamics in financial markets.

Anchoring and guiding market expectations to improve the effectiveness of monetary policy instruments are not the only part that central bank communication can play. As pointed out by Blinder et al., in extreme circumstances, communication may even become the major tool of monetary policy (2008). This prominent role seems to be particularly relevant during the recent global financial crisis: “As long as the current overnight rate is stuck at or near zero, central bank communication about expected future rates becomes the essence of monetary policy” (Blinder et al., 2008). This so-called “forward guidance” type of central bank communication has been frequently used by the Fed, the ECB and the BoE and is dubbed as one of the two most important unconventional monetary policies (the other one is Quantitative Easing).

3. Practice of major central banks

After reviewing related theories, I turn to the communication practices of central banks. A notable change in central banks’ strategy in the recent years has been the movement towards a progressive communication of monetary policy decisions, of the main

objectives that central banks pursue and also their projection regarding future developments in the economy, by these enhancing central banks actions. (Tomuleasa, 2015) The Reserve Bank of New Zealand (RBNZ) was the pioneer and is still among the most advanced central banks worldwide in terms of open communication. The Kiwis got the ball rolling in 1998 and other central banks followed more or less quickly and decisively in a variety of ways since then (Hughes and Kesting, 2014). In the developed world, communication, as a potential powerful tool to pursue monetary policy goals, is getting more attention from academia and central banks themselves. There seems to be even a race to become the champion of transparency: “An explosion of interest in the subject of central bank communication has been seen in recent years. Whereas at one time clever obfuscation was prized, now there is almost a competition to be the most transparent. Central banks are graded on how they speak, and how they write, with those achieving low grades questioning most strongly the validity of the criteria used. The Bank of England, winner of the writing competition, prides itself as achieving substantially improved policy effectiveness by harnessing the power of transparency” (Archer, 2005). Below I briefly introduce the central bank communication practices of two of the world’s major central banks - the Fed and the ECB.

As recorded by Blinder et al. (2008), the Fed’s communication practices can date back to February 1994, when the Federal Open Market Committee (FOMC) first announced its decisions on the target of federal funds rate. Five years later, the FOMC statements

started to contain the content assessing its inclination with respect to future monetary policy changes. It began issuing fuller statements, even when there was no change to interest rates. In 2002, the FOMC votes became available to the public right after each meeting. Since February 2005, the FOMC has been publishing its meeting minutes before the subsequent meeting. After reaching the zero lower bound in the aftermath of the 2008 financial crisis, the Fed has frequently communicated with households, businesses, and investors about the stance of monetary policy expected to prevail in the future, with a (conditional) commitment.

To make its monetary policy understood by the public as best as possible, the ECB puts considerable weight on communicating effectively and interacting properly with the public. According to Issing (2014), the ECB has been using a broad spectrum of communication tools since the euro was created in January 1999. A press conference including a Q&A session is held with the president explaining the monetary policy decisions after every monetary policy decision meeting. Transcripts of the press conference become available on the ECB website a few hours later. Usually one week after the first meeting of the Governing Council every month, the Monthly Bulletin provides encompassing information on the economic and financial background for the decision made. Projections and a number of special reports such as the Financial Stability Review are also published regularly. The members of the Executive Board and the governors of the national central banks give speeches all over the place.

4. Practice of the People's Bank of China

China still has a non-fully-liberalized financial system, in which asymmetric information is the norm. Moreover, since the economy is still in a transitional process towards a market system, the public might have not learnt to understand intentions from observed data. This makes communication extremely important for the central bank of China to fulfill its mandate. The PBoC received its mandate to operate as a central bank in 1983. Unlike its Western counterparts, the PBoC is not fully independent from the government as it reports directly to China's cabinet, the State Council. China's monetary policy has been gradually moving towards that of developed countries not only in terms of deeds but also words. (Garcia-Herrero and Girardin, 2013) Short-term interest rates started to be used as an operational target by the PBoC in the late 1990s. Now the publishing of Quarterly Monetary Reports and statements summarizing the meetings of its Monetary Policy Committee (MPC) are common practice of the PBoC communication. The governing body of the PBoC, especially the governor Zhou Xiaochuan has also become much more active in delivering speeches on monetary policy stance and the outlook for the Chinese economy through press conferences and media interviews.

III. Literature review

With central bank communication getting increasing attention among central bankers and academia since a couple of decades ago, literature on central bank communication has been growing steadily. Most of the literature deals with central bank communication through an empirical approach, centering on a key question whether central bank communication is indeed making a difference in reality as the theory predicts. As mentioned in Section II, due to the difficulty of identifying the effectiveness of central bank communication in influencing output, inflation and employment level, most of the empirical research of central bank communication focuses on examining the impacts of central bank communication on financial markets. Among these studies, some focus on examining whether a central bank communication event leads to any reaction in financial markets at all, while some others go a step further to identify not only the moves of financial asset prices but also the directions of them. Observing whether the financial asset prices move in the central bank intended direction requires defining the intent of central bank communication. The common practice is to use linguistic methods to code central bank communication contents, by assigning positive values to contents that are perceived as delivering a message of tightening or hawkish monetary inclination, negative values to those loosening or dovish messages, and zero to those that appear to be neutral. This is also the approach that almost all the literature on communication of PBoC has taken. While much research was done on central banks of major advanced countries, such as the Fed, the ECB and

the BoE, so far there is relatively limited study on the communication of the PBoC. The rest of this section selectively reviews those studies.

1. Literature on major central banks

Alan Blinder and co-authors provide a comprehensive literature review on central bank communication in the pages of the *Journal of Economic Literature*, issue 46, in 2008, based on which Peter Hughes and Stefan Kesting come up with an updated review on this topic which is published in the *On the Horizon* in 2014. In this sub-section, I include only a few most influential works in this field of study.

Ehrman and Fratzscher (2007) analyze and compare the effectiveness of communication by the Fed, the BoE, and the ECB. Their key argument is that the effectiveness of communication is not independent from the decision-making process. In other words, because of the different communication strategies and decision-making processes taken by these central banks, the effectiveness of their communication may present distinctive features. According to their observation, the Fed has been pursuing a highly individualistic communication strategy amid a collegial approach to decision making, while the BoE is using a collegial communication strategy and highly individualistic decision making. The ECB has chosen a collegial approach both in its communication and in its decision making. Ehrman and Fratzscher define the effectiveness of central bank communication as containing two elements - the ability of

financial markets to predict future monetary policy decisions and the ability of policy makers to influence financial markets by moving asset prices. Their empirical research presents four key findings. First, the predictability of policy decisions is highest for the Fed and the ECB, and lower for the BoE. Second, asset prices react strongest to communication by the Fed and the ECB. Third, U.S. markets react significantly stronger to statements by then-Chairman Greenspan and less to statements by others, whereas euro area markets respond to communication by the ECB president and other officials to a very similar extent. Fourth, U.S. markets react to statements both about the monetary policy inclination and the economic outlook, whereas UK and euro area markets respond mostly only to communication about monetary policy, a difference that most likely reflects also the different market perceptions of policy reaction functions.

2. Literature on the People's Bank of China

The analysis of central bank communication in China is in development as well, albeit not fully fledged. Ji and Song (2012) investigate the short-term impact of the PBoC communication on financial markets by analyzing data from October 2006 to June 2011 with an EGARCH model. The result shows that PBoC communication significantly moves short-term returns (1-month and 3-month Shanghai Interbank Offered Rate) toward the intended direction. However, the impact is smaller than the effect of monetary policies. Another finding is that PBoC communication plays a role

in stabilizing financial markets, but the effect is not significant enough to offset the volatility caused by the surprising elements of policy decisions. Furthermore, by comparing PBoC communication with a tightening inclination and communication with a loosening inclination, Ji and Song find that the effectiveness of tightening communication is bigger than that of loosening communication. Their further analysis shows a stronger effectiveness of verbal communication than written communication, and a stronger effectiveness of communication providing information about monetary policy stance than communication talking about macroeconomic prospects.

Garcia-Herrero and Girardin (2013) empirically assess the impact of PBoC communication on China's overnight repo market, which is considered to be the most active and liquid segment of the money market in China. Both the effects on prices (direct effects) and volumes (indirect effects) are measured. By recording all the speeches delivered by PBoC's governing body, they construct a higher frequency (daily) indicator of the PBoC communication since the mid 2000s. The empirical results show that following communication from the PBoC's governing body, the volatility and volume of overnight repo market change immediately, which means China's monetary markets "listen to" the PBoC. They also find a statistically significant rise in interbank rates right after PBoC communication with a tightening inclination, indicating that China's monetary markets also "understand" the PBoC's messages. Based on this evidence, they conclude that communication of the PBoC works effectively in affecting China's money markets.

Using a structural VAR model, Zhang and Hu (2013) focus on the reactions of stock market to PBoC communication during the period of 2003-2012 and find that PBoC communication reduces the volatility of stock prices, but the significance of the effect is limited. They also find verbal communication is more effective than written communication.

Wu and Pan (2014) use an EGARCH model to examine the impact of PBoC communication on financial asset prices, covering a period from October 2006 to September 2012. Their empirical result shows that PBoC communication has certain influence on financial asset prices with a direction as intended, but the impact is not significant, especially for long term interest rates. As Ji and Song (2012), Wu and Pan also note a more significant impact of verbal communication compared with written communication on financial asset prices. The final finding of their research is that the PBoC governor's talk influences financial asset prices more than other PBoC or MPC officials.

IV. Data and methodology

As explained in previous sections, to examine the effectiveness of central bank communication, an econometrically practical approach is to analyze the reaction of financial markets to central bank communication. A normal practice to do this is to observe both the financial asset return changes and its volatility. The underlying hypothesis is that effective central bank communication should move the financial asset returns toward the desired direction by providing information that is perceived by the market as new and relevant or reducing noises, *ceteris paribus*. In theory, if the communication of the PBoC does make a difference, it should drive up interest rates, cause the Chinese Yuan to appreciate relative to other currencies, while drive down stock market yields in the case of tightening monetary inclination. The impact should be opposite when the PBoC messages convey loosening monetary bias. However, a debatable issue is whether the volatility should rise or reduce with the presence of effective central bank communication. This issue is dealt with later in this section.

1. Measuring communication of the People's Bank of China

I examine the impact of communication of the PBoC on financial markets throughout a period from October 2006 to September 2015. The reason why I choose October 2006 as the starting date of my sample period is that it is in this year that the governor Zhou Xiaochuan started to put more weight on communication, and it is from October 2006 that most of the Chinese financial market indices became publicly available.

First, as a normal practice, I categorize communication of the PBoC into written communication and verbal communication. Written communication includes the PBoC's quarterly Monetary Policy Reports and the statements summarizing the meetings of its MPC. Each issue of the quarterly Monetary Policy Reports provides information on the PBoC's prospect of Chinese economy and its monetary policy inclination in the periods ahead, in addition to a review of monetary policy implementation in the past quarter as well as an analysis of currency credit, financial markets and the macro economy. Statements of the quarterly meetings of the MPC contains similar information but with condensed contents. These two series of reports are available on the official website of the PBoC. As for the verbal communication, I first identify key policy makers and their terms of office in the PBoC, and then in the most commonly used Chinese search engine, Baidu.com, I search their statements, speeches and interviews reported within the sample period and their respective terms of office on a daily basis. The search commands I employ are the name of the policy maker together with one of the terms "monetary policy", "interest rates", "reserve requirement ratio" and "inflation". I keep only forward-looking statements and discard those that explain the most recent policy decision that had been made at the time. In other words, only statements containing monetary policy inclination are recorded. Moreover, only the first report on each communication event is included in the sample, since the objective is to examine the real-time impact of PBoC communication on financial markets. I ignore those MPC members who are not officials in the PBoC, because the MPC is an advisory agency which is constituted with the governor, some

vice governors and leaders of related departments, representatives of banking industry as well as scholars, whose responsibility is mainly to provide advices rather than to make decisions. In fact, those MPC members seldom make any statement about monetary policy. It is the PBoC who has the authority to make monetary policy decisions (of course, under the supervision of the State Council). The policy makers whose talks are finally selected in verbal communication include Zhou Xiaochuan¹, Wu Xiaoling², Su Ning³, Yi Gang⁴, Liu Shiyu⁵, Ma Delun⁶, Hu Xiaolian⁷ and Guo Qingping⁸.

In the second step, I follow the commonly used narrative approach to quantify the PBoC communication contents. Specifically, all communications are classified according to their implications for the likely future path of interest rates. The rule is: when a report or statement conveys an inclination of tightening monetary policy stance, it takes the value of 1; when the communication event implies a bias toward loosening monetary policy stance, it takes the value of -1; all the other communication is given a value of 0. It is important to stress that this classification and valuation involves a degree of subjective judgment and thus does not rule out possible measurement errors in some cases. **Table 1** provides a summary of the classification.

¹ Governor of the PBoC since December 2012.

² Vice governor of the PBoC from April 2001 to December 2007.

³ Vice governor of the PBoC from November 2003 to June 2010.

⁴ Vice governor of the PBoC since December 2007.

⁵ Vice governor of the PBoC from June 2006 to October 2014.

⁶ Vice governor of the PBoC from December 2007 to November 2011.

⁷ Vice governor of the PBoC from July 2009 to February 2015.

⁸ Assistant to the PBoC governor from December 2008 to February 2015; Vice governor of the PBoC since February 2015.

Table 1. PBoC communication classification

		Tightening	Neutral	Loosening	Total
Written Communication	Monetary Policy Reports	8	19	9	36
	MPC Announcements	8	21	8	37
	Sub-total	16	40	17	73
	Percentage	22%	55%	23%	100%
Verbal Communication	Zhou Xiaochuan	37	39	15	91
	Wu Xiaoling	8	0	0	8
	Su Ning	4	3	10	17
	Yi Gang	7	9	8	24
	Liu Shiyu	2	1	2	5
	Ma Delun	3	2	0	5
	Hu Xiaolian	1	7	0	8
	Guo Qingping	2	0	1	3
	Sub-total	64	61	36	161
	Percentage	40%	38%	22%	100%
Total	Total	80	101	53	234
	Percentage	34%	43%	23%	100%

During the sample period, the PBoC released 36 quarterly Monetary Policy Reports and 37 MPC announcements. Among these written communications, tightening monetary stance, neutral monetary stance and loosening monetary stance were delivered 16 times (22%), 40 times (55%) and 17 times (23%), respectively. The samples include 161 verbal communications by the PBoC officials, among which messages about tightening monetary inclination were delivered 64 times (40%); neutral 61 times (38%); loosening 36 times (22%). Compared with written communication, verbal communication tends to be more conservative. Among communicators of the

PBoC, the governor Zhou Xiaochuan plays the key role, who communicates with the market and public most frequently. In summary, the entire sample includes 234 communications, among which 34% deliver a tightening monetary policy inclination, 23% convey a loosening monetary policy inclination and others are neutral in terms of future monetary stance.

2. Financial market data selection

China has already basically established money, bond, stock, insurance, gold, foreign exchange and financial derivatives markets. My study focuses on the reactions of the money market, the bond market, the stock market and the foreign exchange market to PBoC communication. I opt for money market interest rates of different maturities, government bond yields, daily stock yields and the exchange rate of US dollar to Chinese Yuan as the indicators of asset prices in these financial markets. Specifically, the money market interest rates include overnight Shanghai Interbank Offered Rate (Shibor), 1-week Shibor, 2-week Shibor, 1-month Shibor, 3-month Shibor, 6-month Shibor, 9-month Shibor and 1-year Shibor. For the bond market, government bond yields of 2-year, 5-year and 10-year maturities are selected. As for stock yield rates, I use the daily yields of Shanghai Composite Index and the Shenzhen Component Index, which are differences of the natural logarithm of closing prices in these markets, i.e. $Stock_SH_t = \ln(P_SH_t) - \ln(P_SH_{t-1})$; $Stock_SZ_t = \ln(P_SZ_t) - \ln(P_SZ_{t-1})$. In the foreign exchange market, I examine the daily changes of USD/CNY central parity rate, since this rate is still the most important one in the Chinese foreign exchange market. The

daily change rates are obtained by taking the difference of the natural logarithm USD/CNY central parity rate of day t and the previous trading day, i.e. $ER_t = \ln(E_t) - \ln(E_{t-1})$. I use the negative of these values because the purpose is to examine the price of CNY in terms of USD. This variable is defined as ER_CNY/USD .

The Shibor data is extracted from the official Shibor website; the data of government bond yields and the stock markets data are obtained from the WIND database⁹; the exchange rate data is from the website of State Administration of Foreign Exchange. From October 2006 to December 2013, Shibor rates were released on the official website at 11:30 am on every trading day, while since January 2014, the releasing time of Shibor rates has been changed to 9:30 am on each trading day. The increase or decrease of Shibor rates reflects the shocks occurring between the releasing time on the previous day and the releasing time on the current day. As bond market closes at 4:30 pm on trading days, the change of bond yields reflects shocks that take place between 4:30 pm on the previous trading day and 4:30 pm on the current day. Similarly, changes of stock market yield rates reflect shocks between 3:00 pm on trading day $t-1$ and 3:00 pm on trading day t , since the closing time of stock market is 3:00pm. Foreign exchange market closed at 5:30 pm before December 13, 2010, and closed at 4:30 pm ever after, so exchange rate changes reflect shocks appearing after closing time on trading day $t-1$ and before closing time on trading day t .

⁹ <http://www.wind.com.cn/En/>

The descriptive statistics of these financial market variables are shown in **Table 2**.

Table 2. Descriptive statistics of the financial market variables

Variable	Observations	Mean	Std. Dev.	Skewness	Kurtosis
Shibor_1d	2249	2.379297	1.087204	1.888876	12.36892
Shibor_1w	2249	3.017202	1.28334	1.076668	5.933357
Shibor_2w	2249	3.319838	1.405439	0.797694	4.976796
Shibor_1m	2249	3.644726	1.457205	0.418446	3.352829
Shibor_3m	2249	3.774787	1.282491	-0.352713	2.159503
Shibor_6m	2249	3.779026	1.157881	-0.540904	2.058244
Shibor_9m	2249	3.852229	1.112491	-0.59915	1.999304
Shibor_1y	2249	3.95391	1.06795	-0.613089	1.943478
Bond_2y	2249	2.929384	0.777442	-0.403653	2.418377
Bond_5y	2249	3.379469	0.571963	-0.062819	2.351601
Bond_10y	2249	3.793406	0.453384	0.334159	2.209618
Stock_SH	2187	0.000254	0.018347	-0.537475	6.459106
Stock_SZ	2187	0.000383	0.020594	-0.449495	5.234035
ER_CNY/USD	2184	0.0000998	0.001006	-5.046042	92.53142

3. Methodology and empirical model

The descriptive statistics of the financial market variables imply the propriety of using a type of GARCH framework. The EGARCH model corrects for the kurtosis, skewness, and time-varying volatility of the asset prices, therefore, following Ehrmann and Fratzscher (2007), I choose to use EGARCH model to examine the impact of PBoC communication on both the financial asset prices and their volatility.

$$r_t = \alpha + \beta r_{t-1} + \gamma \text{COM}_t + \delta \text{BR}_t + \eta \text{RRR}_t + \chi \text{OMO}_t + \psi \text{MD}_t + \varepsilon_t \quad (1)$$

$$\ln(h_t) = \omega + \mu_1 \ln(h_{t-1}) + \mu_2 \left(\left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| - \sqrt{\frac{2}{\pi}} \right) + \mu_3 \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \rho CD_t + \sigma BD_t + \tau RD_t + \phi OD_t + \emptyset MD_t \quad (2)$$

The EGARCH(1,1) model formulates the conditional mean equation for the asset return r_t as a function of the PBoC communication (COM_t), past returns (r_{t-1}), benchmark lending and deposit rates (BR_t), reserve requirement ratios (RRR_t), the PBoC open market operations (OMO_t) and the releases of macroeconomic data (MD_t). I control monetary policy instrument variables (BR_t , RRR_t and OMO_t) in order to ensure that γ captures solely the effect of the PBoC communication. As I defined earlier, when the communication delivers a message of tightening monetary bias, COM_t takes the value of 1; when the communication contains loosening monetary inclination, COM_t takes the value of -1; when the foreseen monetary stance is neutral, COM_t takes the value of 0. Following the same logic, I define the value of the controlled variables BR_t , RRR_t and OMO_t : when the PBoC increases the benchmark lending and deposit rates, BR_t takes the value of 1 and when the benchmark rates decline, BR_t takes the value of -1. Similarly, when the PBoC increases the reserve requirement ratio, RRR_t is equal to 1; when it is reduced, RRR_t equals to -1. Also, when the PBoC issues central bank bills or sells repos, OMO_t takes the value of 1; when it reverses repos, OMO_t is equal to -1. MD_t is a dummy variable in both the mean equation and the variance equation, which takes 1 on the days when there are macroeconomic data releases or 0 otherwise. I do not differentiate the direction of this variable because it is relatively a less important variable in my model.

I assume $\varepsilon_t = v_t \cdot \sqrt{h_t}$, where v_t is an i.i.d. sequence with zero mean and unit variance. Therefore, the conditional variance h_t can be expressed as a function of communication dummy (CD_t), which takes the value of 1 on days with central bank communication and 0 otherwise, past variance (h_{t-1}) innovations (ε_{t-1}) and the control variables BD_t , RD_t , OD_t and MD_t . These four control variables enter the variance equation as dummy variables, which, respectively, take the value of 1 on days with announcements of benchmark lending and deposit rate changes, announcements of reserve requirement ratio changes, open market operations or macroeconomic data releases, and 0 otherwise.

Rules of variable assignments are summarized below.

$$COM_t = \begin{cases} +1 & \text{communication with tightening monetary inclination} \\ 0 & \text{communication with neutral monetary inclination} \\ -1 & \text{communication with loosening monetary inclination} \end{cases}$$

$$BR_t = \begin{cases} +1 & \text{increasing benchmark lending and deposit rates} \\ -1 & \text{decreasing benchmark lending and deposit rates} \end{cases}$$

$$RRR_t = \begin{cases} +1 & \text{increasing reserve requirement ratio} \\ -1 & \text{decreasing reserve requirement ratio} \end{cases}$$

$$OMO_t = \begin{cases} +1 & \text{issuing central bank bills or selling repos} \\ -1 & \text{reversing repos} \end{cases}$$

$$MD_t = \begin{cases} 1 & \text{macroeconomic data releases} \\ 0 & \text{otherwise} \end{cases}$$

$$CD_t = \begin{cases} 1 & \text{there is PBoC communication} \\ 0 & \text{there is no PBoC communication} \end{cases}$$

$$BD_t = \begin{cases} 1 & \text{there is benchmark lending and deposit rate changes} \\ 0 & \text{there is no benchmark lending and deposit rate changes} \end{cases}$$

$$RD_t = \begin{cases} 1 & \text{there is reserve requirement ratio adjustments} \\ 0 & \text{there is no reserve requirement ratio adjustments} \end{cases}$$

$$OD_t = \begin{cases} 1 & \text{there is open market operations} \\ 0 & \text{there is no open market operations} \end{cases}$$

In the mean equation, I expect the coefficient signs of interest rate variables and foreign exchange rate variable to be positive, while the coefficient sign of the stock return variables is expected to be negative. To be specific, since PBoC communication events with a tightening inclination give COM_t the value of +1 while those with a loosening inclination assign the value of -1 as stated earlier, a positive sign of the coefficients for Shibor and bond rates in the mean equation means yields in these markets increase following tightening PBoC communication and decrease in the case of loosening monetary inclination. Also, a negative sign of COM_t variable coefficients for stock market yields indicates a decline of stock yields due to central bank communication with tightening inclination and a rise after communication with loosening inclination. If the financial asset returns react to central bank communication in this way, it is consistent with theoretical hypotheses and with the PBoC's intention.

The variance equation catches the rise or decline of the asset price volatility following central bank communication. How we should understand the rise or decline needs more discussion. Since the 1990s, the rise of asset price volatility has been interpreted as evidence that the markets listen to the central bank by the growing literature on the

impact of central bank communication on financial markets. The idea that endorses this understanding is that central bank messages may convey new information that tends to move the markets. However, more recently, more studies have understood mitigation in volatility as a sign that central bank communication calms the markets (Garcia-Herrero and Girardin, 2013). Therefore, whether we should expect the volatility of financial assets to rise or reduce following PBoC communication depends on the degree to which the new information surprises the markets or calms them. According to Geraats (2002), this, in turn, depends on the degree of uncertainty prior to an announcement by the central bank and also on the clarity of its messages.

V. Empirical results

1. Overall impact

First, I examine the overall impact of the central bank communication on financial markets in China, using the model specified above. **Table 3** shows the results of the equation estimations. Since I focus on the influence of PBoC communication for now, **Table 3** only reports the coefficients of the PBoC communication variables (COM_t and CD_t) while omits the coefficients of other variables in the model.

In the mean equation, coefficients of COM_t have a positive sign for seven indicators of money market interest rates and bond yield rates out of eleven, and a negative sign for both the Shanghai Composite Index and the Shenzhen Component Index. Therefore, we can generally say that PBoC communication affects the returns of these financial assets in an intended way. However, the divergence of interest rate movements is not negligible. Indeed, the overnight, 14-day, 1-month and 9-month Shibor rates move in a direction against the theoretical prediction and the PBoC's intention as well.

As for the significance, the coefficients of COM_t for both Stock_SH and Stock_SZ are significant at the 5% level, but only four out of eleven coefficients for money market and bond market interest rate variables show a significantly positive sign. The impact on exchange rate is not significant.

All in all, from the mean equation, I have below observations. 1) In the money market, PBoC communication generally affects the interest rates in an intended way, especially for 3-month, 6-month and 1-year interest rates. 2) The inconsistency among moving directions of the interest rates with different maturities is too big to be ignored. This may be a demonstration of the disconnectedness of short, middle and long-term financial markets in China, as a result of inefficient function of the financial markets. 3) In the bond market, PBoC communication moves the yield rates toward its desired direction, and the effect is significant for 10-year government bond rate. 4) In the stock market, stock yields significantly react to PBoC communication in the intended way. 5) In the foreign exchange market, PBoC communication influences the CNY/USD exchange rate in its intended indirection but the impact is not significant.

In the variance equation estimation, a negative sign of CD_t variable coefficients means the communication reduces volatility of financial asset prices, while a positive sign implies an opposite impact. The result shows that PBoC communication significantly influences volatility of money market interest rates (except for 1-week shibor) and the foreign exchange rate. Specifically, it reduces the volatility of 2-week, 1-month and 3-month Shibor in a significant way. Meanwhile, it significantly increases volatility of overnight, 6-month, 9-month and 1-year Shibor as well as the CNY/USD exchange rate. The impact on volatility of stock markets is negative but only significant at the 10% level for the Shanghai stock market return.

As mentioned earlier, whether we should expect the volatility of financial assets to rise or reduce following PBoC communication depends on the degree to which new information surprises the markets or calms them and this, in turn, depends on the degree of uncertainty prior to an announcement by the central bank and also on the clarity of its messages. When the market situation is quite certain and there are not many noises, central bank communication with clear messages may raise the volatility of financial asset prices by “creating news”. Otherwise, when there is great uncertainty going on in the economy, central bank communication may confuse the market even more and promote the volatility by delivering ambiguous messages, or reduce the volatility by clarifying the situation and conveying reliable information.

As we notice, the degree of market uncertainty is quite high in the case of China during our sample period. It experienced high inflation in 2007, financial crisis which caused recession in 2008, severe deflation in 2009, higher inflation expectations of economic rebound in 2010, slow economic growth with high inflation in 2011 and economic ups and downs since 2012. However, the obvious divergence among the reactions of different asset price volatility to PBoC communication makes this “market certainty” and “message clarity” explanation less relevant here. This issue is further touched upon in the next sub-section. Nonetheless, at least two things are certain here: first, central bank communication does exert significant influence on monetary market volatility; second, the disconnectedness between short, middle and long-term financial markets of China is once again indicated.

Table 3. Overall impact of PBoC communication on financial markets

	Mean Equation		Variance Equation	
	Coefficient	Std. Error	Coefficient	Std. Error
Shibor_1d	-0.005050	0.006191	0.343472***	0.022836
Shibor_1w	0.006192	0.005052	-0.008023	0.024588
Shibor_2w	-0.004545	0.003290	-0.213465***	0.025045
Shibor_1m	-0.000131	0.001953	-0.157726***	0.027847
Shibor_3m	0.000638***	0.000144	-0.098477**	0.048767
Shibor_6m	0.001273***	0.000170	0.979916***	0.039826
Shibor_9m	-0.000104	0.000111	0.733284***	0.050022
Shibor_1y	0.001287***	0.000214	0.965341***	0.047463
Bond_2y	0.000487	0.001537	0.039373	0.047745
Bond_5y	0.003445	0.002419	-0.023150	0.041055
Bond_10y	0.004402**	0.001829	-0.019744	0.045323
Stock_SH	-0.002889**	0.001211	-0.071987*	0.038854
Stock_SZ	-0.003684**	0.001435	-0.041071	0.039964
ER_CNY/USD	0.000026	0.000171	0.811811***	0.067076

*** Significant at the 1% level; ** significant at the 5% level; * significant at the 10% level

2. Before, during and after the global financial crisis

Next, I divide the sample period into three phases: pre-crisis period, crisis period and post-crisis period to scrutinize the evolutions of impact of PBoC communication on financial markets. The pre-crisis period lasts from the beginning of the sample (October 2006) to September 2008, during which period the PBoC basically maintained a tight monetary stance in order to contain the risk of economic overheating and high inflationary pressures. Starting from the third quarter of 2008, the PBoC conducted substantial monetary easing against the background of a rampant global

financial crisis. The last phase begins from early 2011, when the PBoC started to describe its monetary stance as “prudent” instead of “moderately loose”. This prudent stance has been maintained till the date when the dissertation is written. In order to compare the impacts of PBoC communication on financial markets before, during and after the crisis, I estimate the same mean and variance equations as I did in the previous sub-section for each of the three sub-samples respectively.

Table 4 shows the estimation results of the mean equation. Again, only coefficients of COM_t variable are reported. The results show that before the crisis, PBoC communication plays a statistically significant role in moving 1-month, 6-month, 9-month and 1-year Shibor as well as the 2-year and 10-year bond returns in the intended direction, but its impacts on other financial market indicators are either not significant or in a direction against the PBoC’s intention. During the crisis, impacts of PBoC communication on financial asset prices became more divergent and only significant for fewer cases, reflecting the uncertain market conditions as well as the limited knowledge and information of the PBoC facing the unprecedented crisis. Apparently, after the crisis, the PBoC communication performs more effectively in terms of moving the financial asset prices toward the intended direction. Specifically, all the money market interest rates and the 2-year bond yield rate move consistently in the direction as the PBoC desires following its communication. Only the 5-year and 10-year long-term bond rates react differently to the PBoC communication, which is not a surprise according to theory. Except for the 1-month Shibor, all the other Shibor

rates are influenced by PBoC communication in a statistically significant way. The negative sign of coefficient for Shenzhen stock market return variable become significant at the 5% level after the crisis. In contrast, the foreign exchange market return changes surprisingly in an opposite direction. In sum, PBoC communication has been improving its effectiveness in moving money markets, bond markets and stock markets after the recent global financial crisis.

Table 4. Before, during and after the global financial crisis – mean equation

	Pre-crisis		Crisis		Post-crisis	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Shibor_1d	-0.013329	0.011568	-0.001713	0.005698	0.153588***	0.032085
Shibor_1w	0.006246	0.033549	0.006213*	0.003313	0.064769**	0.030133
Shibor_2w	-0.033581	0.022462	-0.003038	0.003024	0.088058***	0.023821
Shibor_1m	0.014185**	0.005832	-0.0000567	0.000928	0.019663	0.012769
Shibor_3m	-0.0000543	0.000265	-0.000352*	0.000214	0.002613***	0.000332
Shibor_6m	0.000317*	0.000168	0.000870***	0.000211	0.002024***	0.000236
Shibor_9m	0.000253*	0.000131	0.00000684	0.000139	0.000203***	0.0000754
Shibor_1y	0.000739***	0.000116	0.001026***	0.000135	0.000195**	0.0000915
Bond_2y	0.009471**	0.005131	-0.001318	0.002726	0.002116	0.003253
Bond_5y	0.005028	0.005040	0.003021	0.004358	-0.004552	0.006563
Bond_10y	0.007950**	0.003834	0.000753	0.003586	-0.001344	0.005737
Stock_SH	-0.000892	0.002910	-0.003185	0.002155	-0.003849	0.002380
Stock_SZ	-0.003061	0.003358	-0.001841	0.002597	-0.005779**	0.002904
ER_CNY/USD	0.0000979	0.000168	0.00004	0.0000343	-0.000247	0.000725

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level

Table 5 shows the results of the variance equation estimations. CD_t is adjusted to 0 when there is communication with no monetary policy bias. It is visible that the financial asset price volatilities react to PBoC communication more consistently and

significantly after the crisis, compared with the pre-crisis and crisis periods. Especially, the volatility of all money market interest rates, except for the 9-month Shibor, rises in a statistically significant way following PBoC communication events, implying that the PBoC messages convey information that markets perceive as new and relevant. The obvious more synchronized movements of monetary markets may be explained by an improvement of efficiency in those markets.

Table 5. Before, during and after the global financial crisis – variance equation

	Pre-crisis		Crisis		Post-crisis	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Shibor_1d	-0.260952***	0.091615	1.526444***	0.082718	1.236129***	0.056250
Shibor_1w	0.125623	0.081523	0.182626**	0.081126	0.867860***	0.114914
Shibor_2w	-0.043283	0.113107	0.038993	0.083977	0.279811***	0.061888
Shibor_1m	-0.957275***	0.137251	-0.444258***	0.106178	0.790493***	0.094448
Shibor_3m	-1.124378***	0.138213	-0.005719	0.156343	1.102408***	0.230356
Shibor_6m	0.325628**	0.151421	0.449246***	0.138236	0.577864***	0.109326
Shibor_9m	0.266948	0.184224	0.160886	0.153586	-0.898422***	0.256622
Shibor_1y	1.909293***	0.168304	0.761354***	0.147276	0.668490***	0.147108
Bond_2y	0.365752*	0.191844	0.525575***	0.135393	-0.960283***	0.198437
Bond_5y	-0.432218***	0.129903	-0.021689	0.074593	-0.347488	0.228589
Bond_10y	-0.503572***	0.064976	-0.022923	0.067543	-0.296619	0.201302
Stock_SH	-0.141449	0.107297	0.041890	0.094379	0.042790	0.070491
Stock_SZ	-0.127634	0.104728	0.149194	0.131105	-0.070907	0.100468
ER_CNY/USD	0.076950	0.150600	-0.964422***	0.055789	-0.236223	0.285415

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level

3. A comparison of communication with monetary policy instruments

Previous analysis has shown that central bank communication is working increasingly efficiently in moving financial asset price in China. Then a comparison of its

effectiveness and that of monetary policy instruments of the central bank becomes relevant. In addition to the COM_t variable, **Table 6** reports the coefficients of three controlled variables in the mean equation to catch the impacts of the benchmark lending and deposit rates (BR_t), reserve requirement ratio (RRR_t) and open market operations (OMO_t) on the financial market returns.

For the pre-crisis sub-sample, coefficients of the BR_t variable and the RRR_t variable are positive and significant for most cases of the money markets and the government bond markets, inferring the effectiveness of these monetary policy instruments in moving these markets, although they seem to work less effectively in the stock markets and the foreign exchange market. In comparison, as is described in the previous sub-section, coefficients of the COM_t variable are significant and positive only for 1-month, 6-month, 9-month and 1-year Shibor as well as 2-year and 10-year bond market returns. For other money markets, stock markets as well as the foreign exchange market, the coefficients of COM_t are either insignificant or showing an undesired sign. A further comparison of the coefficients of the COM_t variable with the coefficients of the BR_t variable and the RRR_t variable for the case of 1-month, 6-month, 9-month and 1-year Shibor shows that the COM_t coefficients are much smaller than BR_t coefficients, while slightly smaller than RRR_t coefficients. These observations evidence the small effectiveness of communication before the recent global financial crisis, relative to that of the monetary policy instruments at the disposal of the PBoC.

The post-crisis sub-sample unfolds a different picture. For all interest rates with a maturity up to 2 years as well as the stock market returns, the coefficients of COM_t show a desired sign and are significant for most cases. The BR_t and the RRR_t coefficients continue to show a sign as intended but are significant for fewer cases than the pre-crisis period, mostly for longer term interest rates. The absolute value of COM_t coefficients becomes even larger than that of the BR_t and the RRR_t coefficients, in most cases of short-term interest rates and stock market returns. Therefore, there is evidence that communication has become an increasingly important tool for the PBoC to move financial market returns, especially money market interest rates, compared with its monetary policy instruments. Again, an exception is found in the foreign exchange market. Open market operations seem to have ambiguous influence on financial asset price movements for some reasons, but this issue falls out of the scope of this study.

Table 6. A comparison of communication and monetary policy instruments – mean equation

		Pre-crisis		Crisis		Post-crisis				Pre-crisis		Crisis		Post-crisis	
		Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error			Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Shibor_1d	COM	-0.013329	0.011568	-0.001713	0.005698	0.153588***	0.032085	Shibor_1y	COM	0.000739***	0.000116	0.001026***	0.000135	0.000195**	9.15E-05
	BR	0.068927	0.053558	0.014977	0.058203	0.031305	0.024876		BR	0.045912***	0.004773	0.131000***	0.006261	0.013186***	0.004457
	RRR	0.027599	0.016780	0.043762**	0.019523	0.017230	0.088461		RRR	2.19E-05	0.000184	0.001157	0.001687	2.76E-05	0.000177
	OMO	0.001144	0.008405	-0.003037**	0.001237	0.007759**	0.003494		OMO	6.93E-06	8.47E-05	-8.97E-05	9.78E-05	-6.10E-05***	1.04E-05
Shibor_1w	COM	0.006246	0.033549	0.006213*	0.003313	0.064769**	0.030133	Bond_2y	COM	0.009471*	0.005131	-0.001318	0.002726	0.002116	0.003253
	BR	0.103422***	0.024760	0.080026	0.062500	0.014716	0.026670		BR	0.043651***	0.013291	0.114687***	0.013854	0.028469**	0.011660
	RRR	0.125992**	0.050186	0.005412	0.056297	0.160444**	0.075055		RRR	0.025765*	0.013691	0.047696***	0.013318	0.027803***	0.010642
	OMO	0.019169	0.015778	-0.003178	0.002374	0.006406	0.004593		OMO	0.001571	0.002192	0.001609	0.001255	-0.001049	0.001065
Shibor_2w	COM	-0.033581	0.022462	-0.003038	0.003024	0.088058***	0.023821	Bond_5y	COM	0.005028	0.005040	0.003021	0.004358	-0.004552	0.006563
	BR	0.183055***	0.065053	0.017889	0.053162	0.071396**	0.028426		BR	0.047934***	0.014230	0.118770***	0.016992	0.029351**	0.012871
	RRR	-0.061385	0.038364	0.068135**	0.034736	0.011787	0.040698		RRR	0.009457	0.009512	0.013505	0.011520	0.031511***	0.008350
	OMO	0.016310	0.010743	-0.000704	0.001976	0.019456***	0.006626		OMO	-0.001472	0.002935	0.003369	0.002228	-0.000852	0.001137
Shibor_1m	COM	0.014185**	0.005832	-5.67E-05	0.000928	0.019663	0.012769	Bond_10y	COM	0.007950**	0.003834	0.000753	0.003586	-0.001344	0.005737
	BR	0.047745	0.030032	0.053976*	0.032626	0.008999	0.019176		BR	0.040004	0.024384	0.140186***	0.012894	0.022737	0.015094
	RRR	0.039581***	0.002786	0.008087	0.023195	-0.082643***	0.029545		RRR	0.006362	0.006829	0.028569*	0.016232	0.029471***	0.007390
	OMO	-0.000977	0.001123	-0.001885***	0.000565	0.001856	0.004347		OMO	-0.001288	0.002475	0.001570	0.002164	0.000826	0.000957
Shibor_3m	COM	-5.43E-05	0.000265	-0.000352*	0.000214	0.002613***	0.000332	Stock_SH	COM	-0.000892	0.002910	-0.003185	0.002155	-0.003849	0.002380
	BR	0.032677***	0.003182	0.063325***	0.007513	0.001223	0.008750		BR	0.017685***	0.006667	-0.004169	0.008324	-0.001778	0.004532
	RRR	-1.06E-05	0.000674	-8.42E-06	0.001557	0.006696**	0.002871		RRR	-0.001759	0.009187	0.001314	0.006361	-0.002542	0.002349
	OMO	-3.08E-05	0.000224	-7.85E-05	0.000171	-0.000103	0.000113		OMO	-0.001587	0.001831	-0.004377***	0.001522	-0.001162*	0.000602
Shibor_6m	COM	0.000317*	0.000168	0.000870***	0.000211	0.002024***	0.000236	Stock_SZ	COM	-0.003061	0.003358	-0.001841	0.002597	-0.005779**	0.002904
	BR	0.014823***	0.004006	0.103876***	0.003812	0.014928*	0.007857		BR	0.019282**	0.009494	-0.002968	0.009120	-0.006595	0.005550
	RRR	0.000551**	0.000271	0.004326**	0.001968	0.003499*	0.001946		RRR	-0.002265	0.012653	0.005681	0.009468	-0.004977*	0.002872
	OMO	1.80E-06	6.37E-05	8.48E-05	0.000160	4.20E-05	3.59E-05		OMO	-0.002109	0.002144	-0.004993***	0.001669	-0.001958***	0.000644
Shibor_9m	COM	0.000253*	0.000131	6.84E-06	0.000139	0.000203***	7.54E-05	ER_CNY/ USD	COM	9.79E-05	0.000168	4.00E-05	3.43E-05	-0.000247	0.000725
	BR	0.026009***	0.004134	0.112476***	0.005018	0.005022	0.003993		BR	-2.88E-05	0.000945	-0.000624	0.000729	0.000458**	0.000179
	RRR	0.000908***	0.000271	0.001786	0.002003	0.001674	0.001723		RRR	-0.000213	0.000325	-4.06E-05	0.000202	4.29E-05	0.000172
	OMO	3.36E-05	6.86E-05	-0.000151	0.000115	1.62E-06	6.36E-06		OMO	-1.61E-05	9.67E-05	-5.50E-05	3.76E-05	6.30E-05	6.79E-05

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Table 7 reports the coefficients of three controlled dummy variables in the variance equation besides the dummy variable CD_t , whose coefficient captures communication's effect on financial volatility. CD_t is adjusted to 0 when there is communication with no monetary policy bias. Coefficients of the other three controlled dummy variables respectively show the impact of benchmark lending and deposit rate changes (BD_t), reserve requirement ratio adjustments (RD_t) and open market operations (OD_t) on financial volatility.

The first impression is that PBoC's monetary tools generally become more able to move financial market volatility in a statistically significant way after the financial crisis compared with the crisis period. Another observation is that PBoC communication tends to influence financial market stability in the opposite direction to the benchmark lending and deposit rate adjustments. In other words, a complementary effect is observed between PBoC's talks about its inclination of future monetary stance and its real actions to change benchmark lending and deposit rates. Particularly, in the short-term money markets, communication by the PBoC tends to raise the price volatility by providing information that is perceived by the market to be new and relevant, while the real actions to change benchmark lending and deposit rates seem to reassure the markets. Whereas the benchmark lending and deposit rates and reserve requirement ratio remain as the major tools to exert influence on the volatility of financial asset returns, communication has been gaining more weight. In the foreign exchange market, both communication and monetary policy instruments significantly influence volatility and communication tends to calm down the market.

Table 7. A comparison of communication and monetary policy instruments – variance equation

		Pre-crisis		Crisis		Post-crisis				Pre-crisis		Crisis		Post-crisis	
		Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error			Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Shibor_1d	CD	-0.260952***	0.091615	1.526444***	0.082718	1.236129***	0.056250	Shibor_1y	CD	1.909293***	0.168304	0.761354***	0.147276	0.668490***	0.147108
	BD	1.47535***	0.243243	2.749575***	0.635899	-1.468448***	0.220279		BD	5.49572***	0.40486	4.267901***	0.853776	5.116553***	0.310490
	RD	-1.171692***	0.162862	-0.466875	0.633027	1.263343***	0.120393		RD	0.59853*	0.347617	1.150855*	0.603430	1.172389***	0.280388
	OD	0.015836	0.100329	-0.613687***	0.084462	-0.325521***	0.015661		OD	0.65627***	0.151804	0.161040	0.120364	-1.214296***	0.044822
Shibor_1w	CD	0.125623	0.081523	0.182626**	0.081126	0.867860***	0.114914	Bond_2y	CD	0.365752*	0.191844	0.525575***	0.135393	-0.960283***	0.198437
	BD	-1.938676***	0.319189	0.194098	0.418791	-0.688325***	0.238319		BD	0.969613***	0.304906	1.094776	0.745887	0.837648	0.691708
	RD	1.292869***	0.134797	0.567078*	0.339006	1.737127***	0.219336		RD	1.191254***	0.401559	1.045792**	0.413852	0.829308***	0.287155
	OD	0.297652***	0.11142	1.043675***	0.090692	-0.048770	0.044917		OD	0.112364	0.080904	0.236904**	0.114217	-0.000448	0.063826
Shibor_2w	CD	-0.043283	0.113107	0.038993	0.083977	0.279811***	0.061888	Bond_5y	CD	-0.432218***	0.129903	-0.021689	0.074593	-0.347488	0.228589
	BD	0.324117	0.254538	0.789161	0.494127	-0.847744***	0.124391		BD	0.990776***	0.291662	1.332937***	0.330874	1.267662***	0.341379
	RD	1.254835***	0.174459	1.094675***	0.424016	0.704482***	0.087940		RD	0.809602***	0.214188	-0.208556	0.312406	0.858738***	0.175229
	OD	-0.094273	0.104122	0.595372***	0.093488	-0.055821***	0.020632		OD	0.437042***	0.116802	-0.400279***	0.132227	-0.000537	0.055479
Shibor_1m	CD	-0.957275***	0.137251	-0.444258***	0.106178	0.790493***	0.094448	Bond_10y	CD	-0.503572***	0.064976	-0.022923	0.067543	-0.296619	0.201302
	BD	1.185992***	0.295736	0.986750**	0.428386	-0.566817***	0.196927		BD	0.661703***	0.183591	0.477893	0.311682	1.287711***	0.378441
	RD	1.897149***	0.426769	1.141756***	0.368881	1.098777***	0.105770		RD	0.517012***	0.131212	0.353765*	0.201096	0.338055	0.278865
	OD	0.145559***	0.055493	0.487720***	0.111226	0.045798	0.038200		OD	0.124166	0.113872	-0.451600***	0.141360	-0.106508*	0.057087
Shibor_3m	CD	-1.124378***	0.138213	-0.005719	0.156343	1.102408***	0.230356	Stock_SH	CD	-0.141449	0.107297	0.041890	0.094379	0.042790	0.070491
	BD	4.066516***	0.475129	2.138520***	0.463806	2.121438***	0.440662		BD	-0.803917***	0.301713	-0.471956	0.365525	0.370036**	0.152720
	RD	0.643793***	0.205348	0.594179	0.366155	1.850792***	0.245132		RD	1.034847***	0.229093	0.502952**	0.200879	-0.351888***	0.128126
	OD	-0.245807*	0.132137	0.361479***	0.137196	-0.444788***	0.053883		OD	-0.319258**	0.127233	-0.211795	0.140857	-0.075011***	0.020781
Shibor_6m	CD	0.325628**	0.151421	0.449246***	0.138236	0.577864***	0.109326	Stock_SZ	CD	-0.127634	0.104728	0.149194	0.131105	-0.070907	0.100468
	BD	5.080424***	0.25562	2.266048***	0.711887	2.628519***	0.311158		BD	-0.818141**	0.327866	-0.306146	0.465264	0.452172*	0.242630
	RD	0.944257***	0.247367	1.382889**	0.569897	1.441931***	0.286640		RD	1.036485***	0.241109	0.922918***	0.246430	-0.206010	0.177682
	OD	-0.093614	0.135539	1.009591***	0.130397	-0.328846***	0.043352		OD	-0.225850	0.140464	-0.443723***	0.154507	-0.150368***	0.028600
Shibor_9m	CD	0.266948	0.184224	0.160886	0.153586	-0.898422***	0.256622	ER_CNY/USD	CD	0.076950	0.150600	-0.964422***	0.055789	-0.236223	0.285415
	BD	4.611562***	0.439148	3.083390***	0.716858	4.926167***	0.197620		BD	0.410381	0.418436	1.721229***	0.211714	-2.211933***	0.651535
	RD	1.623561***	0.305466	1.226201**	0.571727	3.547653***	0.132129		RD	0.208488	0.246027	-0.837525***	0.170842	-0.490384	0.457375
	OD	0.146359	0.184516	-0.015107	0.122991	0.300948***	0.044641		OD	0.294238*	0.166435	1.016060***	0.083200	1.002013***	0.074813

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

VI. Conclusions and implications

The last two decades have seen a dramatic transformation of central banks from a secretive and arcane monetary authority toward an open and transparent financial market player that frequently exchange information and knowledge with the public. Research on central bank communication is spawning accordingly. This dissertation has conducted a comprehensive review of the relevant theoretical expositions underlining this evolution. Communication practices of major central banks and the PBoC have also been visited with a comparative perspective. By scrutinizing the connections between central bank communication and financial markets, I have indentified the research approach taken by the growing studies (mostly empirical) on this topic and also for my own dissertation. Based on this work, an empirical study engaging an EGARCH model has been conducted to examine the impact of central bank communication on financial markets, including the money market, the government bond market, the stock market and the foreign exchange market, in the case of China. This impact can be considered as an epitome of the effectiveness of the PBoC communication.

First, an overall EGARCH estimation is conducted on the entire sample period from October 2006 to September 2015, to check impacts of central bank communication on financial markets in China during these nine years. In the case of the “price effect”, the result shows that PBoC communication generally tends to drive the money market interest rates to move in its intended way, especially for the case of 3-month, 6-month

and 1-year Shibor. Still, divergent reactions of interest rates of different maturities are significant enough to warrant noting here, which may suggest the lack of efficiency in the Chinese money markets. The situation in the stock market seems to be less ambiguous - stock yields react to PBoC communication toward the intended direction in a statistically significant way. As for the “volatility effect” of the PBoC communication on financial markets, the major finding is that volatilities of various financial markets generally react to the communication by the PBoC in a statistically significant way, whereas the volatility movements do not present a consistent pattern. Since the desirability of financial market volatility rises or reductions depends on the degree of uncertainty before the PBoC communication events and the clarity of communication messages, separate case studies may be required to understand and exposit the volatility changes in different financial market segments at different times.

Further on, I compare the PBoC communication’s effects on financial markets before, during and after the recent global financial crisis and also compare the role of communication against that of monetary policy instruments of the PBoC. My key findings infer to a conclusion that communication has been playing an increasingly important role in efficiently managing market expectations and promoting monetary policy effectiveness, both in absolute terms (as explained in Section V - 2) and in relative terms (as explained in Section V - 3). On one hand, the PBoC communicates with the market more effectively after the crisis in the sense that it is able to move all money market interest rates as well as the stock market returns toward the intended

direction through communication, and the impact is statistically significant for most cases. The obvious more synchronized rises of monetary market volatilities after the global financial crisis imply that the PBoC messages convey information that markets perceive as new and relevant. On the other hand, compared with monetary policy instruments, communication's effects become larger after the crisis and meanwhile a complementary effect is observed between PBoC's talks about its inclination of future monetary stance and its real actions to change benchmark lending and deposit rates.

Taking the preconditions of effective central bank communication into account, the greater effectiveness of PBoC communication after the global financial crisis, both in an absolute sense and in a relative sense, may be a result of a variety of factors that have allowed the PBoC to become a more qualified communicator, such as the on-going financial reforms and accumulated experiences in communication of the PBoC etc.

Above all, despite the non-fully-independence status, the PBoC has become increasingly credible to the markets. Although it is widely hold by western scholars and central bankers that independence is a critical factor for central bank credibility, this is arguably not so true in the case of China. Given the well-known relationship between the PBoC and the State Council as well as the decision-making process of Chinese monetary policies, the markets tend to consider anything about future monetary stance said by the PBoC as having been approved by the State Council or at least being in

alignment with the goal of the central government. In other words, PBoC officials do not speak as frequently and freely as their counterparts in the advanced central banks do, but whenever they talk, the markets take what they say seriously and adjust their expectations accordingly. In addition, as accumulating more experiences in communication, the PBoC may become increasingly skillful in managing market expectations by delivering designed and clear messages to the markets.

Meanwhile, Chinese financial markets may have been learning how to interpret the central bank's messages and what further actions to expect from it. By learning and adapting, the market agencies with rational expectations can make decisions that lean toward the wind.

Moreover, we can observe the role of financial market development and sophistication in incorporating news that is created by central bank communication. Improvement of financial market efficiency has facilitated the consistent reactions of short-, middle- and long-term money markets (at least the short- and middle-term ones) to the communication by the central bank of China.

Finally, although the Chinese economy has been experiencing ups and downs but the degree of uncertainty is relatively smaller than that in previous years, and this may have made “reducing noises” less challenging for the PBoC.

The foreign exchange market seems to be an outlier, where PBoC communication is not evidenced to play a critical role, which is not a surprise if we notice the characteristics of Chinese foreign exchange market.

Based on these conclusions, a few implications can be drawn. First, communication has become a reliable tool complementary to other monetary policy instruments that can be used by the PBoC to enhance monetary policy effectiveness. Second, in order to maximize the effectiveness of central bank communication and other monetary policies, the PBoC should continue to promote the marketization of financial asset prices and improve the financial market efficiency. In addition, the PBoC may want to continue to enhance its credibility by always walking the talk, and strengthening its analytical and forecast capacities as well as communication skills. Improving the ability of “reducing noises” by developing stronger analytical and forecast capacities is especially important for the PBoC to calm down the markets amid a crisis. The PBoC may also make more efforts to impart the public with financial knowledge so that the interaction between the central bank and the markets could become more efficient.

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